

**What is claimed is:**

1. A process for coproducing butene oligomers and  
tert-butyl ethers from isobutenic C<sub>4</sub> streams by
  - 5 a) partly oligomerizing the isobutenic C<sub>4</sub> streams  
over an acidic catalyst to give butene  
oligomers and subsequently
  - b) etherifying the remaining isobutene with an  
alcohol under acidic catalysis to give tert-  
10 butyl ethers,  
which comprises  
carrying out the etherification under acid  
catalysis in stage b) in at least two reaction  
stages, of which at least the last reaction stage  
15 is carried out as a reactive distillation.
2. The process as claimed in claim 1,  
wherein  
the acidic catalyst used in stage a) is an ion  
20 exchanger whose protons have partly been exchanged  
for metal ions of groups 1 to 12 of the Periodic  
Table.
3. The process as claimed in claim 2,  
25 wherein  
from 1 to 60% of the protons of the ion exchanger  
used in stage a) have been exchanged for metal  
ions.
- 30 4. The process as claimed in any of claims 1 to 3,  
wherein  
the oligomerization in stage a) is carried out up  
to an isobutene conversion of from 50 to 95%.
- 35 5. The process as claimed in any of claims 1 to 4,  
wherein  
the oligomerization in stage a) is carried out in  
the presence of a moderator.

6. The process as claimed in claim 5,  
wherein  
the moderator used is MTBE, TBA, methanol or water  
in a molar ratio of from 0.01 to 5 per mole of  
isobutene.
7. The process as claimed in any of claims 1 to 6,  
wherein  
the butene oligomers obtained in stage a) are  
removed before the acid-catalyzed etherification  
in stage b).
8. The process as claimed in any of claims 1 to 7,  
wherein  
the alcohol used in stage b) is methanol or  
ethanol.
9. The process as claimed in any of claims 1 to 8,  
wherein  
the polyunsaturated hydrocarbons contained in the  
isobutenic C<sub>4</sub> streams are catalytically  
hydrogenated before the oligomerization in stage  
a).
10. The process as claimed in claim 9,  
wherein  
the polyunsaturated compounds are hydrogenated in  
at least two reaction stages, of which at least  
the last reaction stage is carried out in the  
presence of 0.05 - 100 ppm by weight of CO.
11. The process as claimed in any of claims 1 to 10,  
wherein  
more than 90% of the butene oligomers obtained in  
stage a) are isobutene oligomers.